Action Item 5 – Steps in Enhanced Flow Monitoring Plan and Model Validation

1. Develop Rainfall and Flow Monitoring Plan
a. Test radar rainfall efficacy
i. Contract with radar rainfall specialist
ii. Develop gage adjusted radar rainfall (GARR) time series for each basin, each calibration storm
iii. Run 2014 model with GARR input
iv. Develop model validation statistics
v. Develop runoff frequency and volume
vi. Compare and document results of 2014 model with rain gage only and 2014 model with GARR
b. Develop enhanced rainfall gage network
i. Hypothesize "ideal" rainfall locations
1. Consult GARR expert
2. Adapt for proximity to model input points
ii. Identify feasible gage sites near
1. Identify public properties
2. Scrutinize properties for gage exposure potential
3. Prepare site exposure drawings
4. Verify gage locations with EPA
2. EPA & PADEP Approval of Rainfall and Flow Monitoring Plan
3. Contract for Rainfall and Flow Monitoring Services
4. Flow data assessment and additional rainfall and flow monitoring
a. Develop enhanced monitoring
i. Review past monitoring and modeling questions
ii. Evaluate and prepare map (showing current pipes, monitoring locations and sub-basins with monitors color coded for reliability/quality) existing permanent monitoring equipment and make recommendations (if any) for improvement of existing monitors (e.g. WWTP, Pump Stations, CSOs)
iii. Hypothesize improved or added monitoring locations to strengthen the system wide monitor, e.g.,North pump station, Manheim, CSO monitor calibration, others
iv. Draft monitoring plan
v. Review monitoring plan with EPA
vi. Contract for procurement and installation and operation of monitors, with operation of permanent monitors to be turned over to City,
vii. Conduct monitoring per plan
viii. Consolidate and quality check monitoring data
5. H&H Model refinement to validate and calibrate the model
a. Input rain gage data to model
b. Update model catchments/pipes/devices to monitoring period conditions

6. Dry and Wet weather flow calibration, including quantitative and qualitative calibration criteria
a. Run model for monitoring period
b. Develop model validations statistics
c. Develop runoff frequency and volume
d. Compare and document results
e. Re-calibrate if necessary
f. Compare and document recalibration
7. Model Validation Report a. Document validated model
b. Update CSO Statistics